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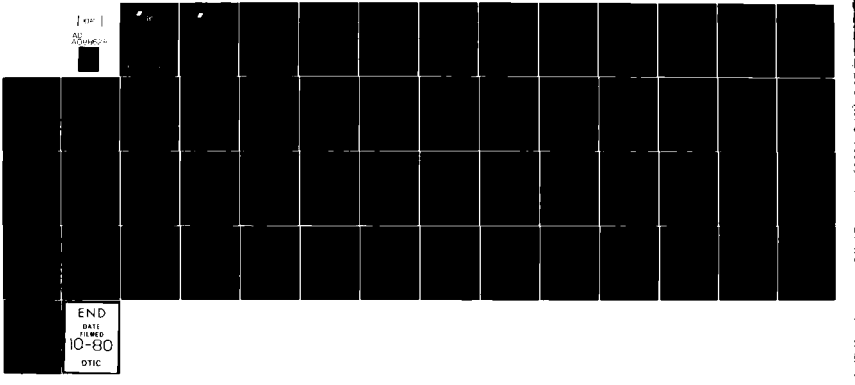

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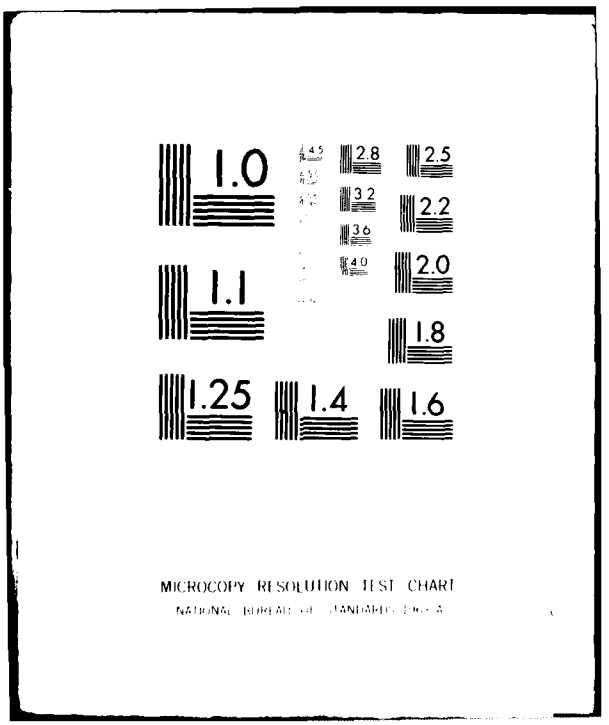
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DEPARTMENT OF TRANSPORTATION

COAST GUARD

LEVEL II

SPECIMEN EXAMINATIONS FOR MERCHANT MARINE ENGINEER LICENSES (2nd and 3rd Assistant)

1 FEBRUARY 1976

CG-182-1

DEPARTMENT OF TRANSPORTATION

COAST GUARD

(6)

SPECIMEN EXAMINATIONS FOR MERCHANT MARINE ENGINEER LICENSES (2nd and 3rd Assistant)

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FOREWORD

This pamphlet, "Specimen Examinations for Merchant Marine Engineers Licenses (2nd and 3rd Assistant)," CG-182-1, contains examination specifications, sample questions, and general information concerning written examinations which candidates for Merchant Marine Engineer Officer's licenses are required to pass to demonstrate their professional qualifications.

This pamphlet supersedes the edition of CG-182-1, dated 1 April 1975.

It is hoped that the information contained herein will be helpful to those endeavoring to qualify for licenses as Third or Second Assistant Engineer.

Dist: (SDL No. 106)
A: None
B: b(1); c(9); e(5); j(25); n(120); p(1)
C: em(1)
D: aim(i)
E: mn(1)
F: kp(1)

INTRODUCTION

The specimen examinations published herein are for the purpose of acquainting prospective candidates with the format and content of the qualifying examinations for Third or Second Assistant Engineer licenses.

This examination format and content is part of a long-range project undertaken by the Coast Guard to modernize its licensing and certification program. This project began with a study of the overall testing program administered by the Coast Guard. This study concluded that basic changes were necessary in order to:

(1) Eliminate obsolete examination content,
(2) Include up-to-date examination content,
(3) Reduce examination time,
(4) Insure objective grading.

In order to eliminate obsolete and include current material, the Coast Guard solicited and received advice and assistance from all segments of the maritime industry (management, labor, training institutions, and government agencies) in revising examination content. The questions contained in the multiple choice examinations have been extensively reviewed by instructors from various union training programs, shipping company representatives, state sponsored training organizations, private upgrade schools, several maritime academies and actively sailing marine engineers. The reduction in administration time and the insurance of objective grading were accomplished by converting all portions of the examinations to a standardized multiple choice format. Introduction of the new examinations occurred on 1 January 1974. They are administered on a regularly scheduled basis throughout the country so that all applicants will take the same exam at the same time. Details concerning this scheduling are contained later in this publication. IT IS THE CANDIDATE'S RESPONSIBILITY TO INSURE THAT HE HAS AN APPROVED APPLICATION ON FILE AT THE OFFICE IN WHICH HE WILL BE EXAMINED PRIOR TO THE SCHEDULED DATE OF EXAMINATION. The candidate must also check for the precise administration times of the examinations in that office since working hours may vary slightly among offices.

Additional detailed information concerning requirements for service, physical examination, citizenship, and so forth is contained in Subchapter B - Merchant Marine Officers and Seamen, of Title 46 of the Code of Federal Regulations. These requirements may be reviewed and further information obtained at any Marine Inspection Office or Marine Safety Office.

Age and Experience

Applicants must be at least 21 years of age, with the exception of Third Assistant Engineers, who must be at least 19 years of age. Minimum qualifying experience is required for each grade of license. The basic requirement is 3 years' service for original Third Assistant Engineer and one year's service as Third Assistant Engineer to qualify for Second Assistant Engineer. These requirements and equivalent service which may be accepted are set forth in detail in 46 CFR, 10.02.

Citizenship

All applicants for an original, renewal, or raise of grade of license must be citizens of the United States, native born, or fully naturalized. This must be established by acceptable documentary evidence. Persons not able to prove American citizenship will not be examined for an original license.

INTRODUCTION

Applications

Form CG-866 (License Applications) may be obtained either by written request or personal application to any Commanding Officer, Marine Safety Office or Officer in Charge, Marine Inspection, U.S. Coast Guard. It must be completed in all respects. All statements of sea service made therein must be supported by documentary evidence, issued by responsible persons, officers, or organizations. When the application has been completed, it must be presented personally by the applicant at a Marine Inspection Office. Each applicant for an original license is required to have a written endorsement from a Master and two other licensed officers of a vessel on which he has served.

Physical Examination

Upon acceptance and approval of his application, the candidate will be sent to one of the offices of the U.S. Public Health Service for a physical examination.

For an original license as engineer, the applicant must have uncorrected vision of at least 20/100 in both eyes, correctable to at least 20/30 in one eye and 20/50 in the other. In addition, he will be tested for satisfactory color sense.

Those persons contemplating a career in the Merchant Marine are cautioned that these visual acuity standards reflect the requirements at the time the original license is issued. They should determine, as early in their career as possible, that they will in fact be able to meet them.

Administration and Scheduling of the Examinations

The examinations for 3rd and 2nd Assistant Engineers will be administered once each month beginning on the second Tuesday of each month as indicated in the table (page vii). If at any time a national holiday falls on a Tuesday, Wednesday, Thursday, or Friday, the examination will begin on Monday of that week to allow for such holiday. The time allowed for individual modules may vary up to 3 hours and 30 minutes, and a minimum score of 70% is required to pass any module.

Grading and Notification of Results

All completed examinations will be forwarded to a central exam center for grading. As soon as grading is complete, the OCMI/Commanding Officer will be notified and he will in turn notify the applicants. Depending to some extent on mail service, it is anticipated that from 10 to 14 days will be sufficient for results to be returned.

For those successful applicants who do not wish to make an additional trip to the Coast Guard Office to receive their license, arrangements may be made to have the license mai :d to their home address. Candidates who fail part or all of the examination may make arrangements for reexamination as outlined in the table of reexamination procedures (page viii).

THIRD ASSISTANT ENGINEER

DAY		SUBJECT	STEAM	MOTOR	STEAM & MOTOR
Tues. AM	I.	Propulsion Diesel Engines, Fuel & Lube Oil Systems		X	X
Tues. PM	II.	Diesel Engines, Cooling, Starting, Intake & Exhaust Systems & Drive Train		X	X
Wed. AM	III.	Auxiliary Boilers, Water Systems & Engineering Safety		X	
Wed. AM	III.	Auxiliary Diesel Engines, Water Systems & Engineering Safety	X		X
Wed. PM	IV.	Miscellaneous Systems	X	X	X
Thurs AM	V.	Electricity	X	X	X
Thurs PM	VI.	Boilers, Steam & Water Cycles	X		X
Fri. AM	VII.	Turbine Assemblies, Fuel & Lube Oil Systems	X		X

SECOND ASSISTANT ENGINEER

DAY		SUBJECT	STEAM	MOTOR	STEAM & MOTOR
Tues. AM	I.	Boilers, Fuel Oil & Combustion Control Systems		X	X
Tues. PM	II.	Diesel Engines & Associated Diesel Systems		X	X
Wed. AM	III.	Steam, or Steam & Motor Review	X		X
Wed. AM	III.	Motor Review		X	
Wed. PM	IV.	Engineering Safety	X	X	X
Thurs. AM	V.	Watertube Boilers	X		X
Thurs. PM	VI.	Feedwater, Fuel Oil & Combustion Control Systems	X		X

EXAMINATION, RETEST AND REEXAMINATION PROCEDURE

INITIAL COMPLETE EXAM CYCLE WITHIN GRADE - ENGINEER LICENSE

Steam or Motor License Only

IF	THEN	BUT IF	THEN
Unsatisfactory in not more than 2 sections	Must be retested only in unsatisfactory sections at one of the next three regularly scheduled exam periods. See footnotes (1), (2) and (3).	Unsatisfactory in any sections on retest	Considered to fail complete exam. May be re-examined at any regularly scheduled exam period
Unsatisfactory in 3 or more sections	Considered to fail complete exam. May be re-examined at any regularly scheduled exam period. See footnote (2).		

Combined Steam and Motor License

IF	THEN	BUT IF	THEN
Unsatisfactory in not more than 3 sections	Must be retested only in unsatisfactory sections at one of the next three regularly scheduled exam periods. See footnotes (1), (2) and (3).	Unsatisfactory in any sections on retest	Considered to fail complete exam. May be re-examined at any regularly scheduled exam period.
Unsatisfactory in 4 or more sections	Considered to fail complete exam. May be re-examined at any regularly scheduled exam period. See footnote (2).		

SECOND OR SUBSEQUENT CYCLE WITHIN GRADE - ENGINEER LICENSES

Steam or Motor License Only

IF	THEN	BUT IF	THEN
Unsatisfactory in not more than 2 sections	Must be retested only in unsatisfactory sections at one of the next three regularly scheduled exam periods. See footnotes (1), (2) and (3).	Unsatisfactory in any sections on retest	Considered to fail complete exam. Next re-exam not allowed sooner than the third regularly scheduled exam period
Unsatisfactory in 3 or more sections	Considered complete failure. Next complete re-exam not allowed sooner than the third regularly scheduled exam period. See footnote (2).		

Combined Steam and Motor License

IF	THEN	BUT IF	THEN
Unsatisfactory in not more than 3 sections	Must be retested only in unsatisfactory sections at one of the next three regularly scheduled exam periods. See footnotes (1), (2) and (3)	Unsatisfactory in any sections on retest	Considered to fail complete exam. Next re-exam not allowed sooner than the third regularly scheduled exam period
Unsatisfactory in 4 or more sections	Considered complete failure. Next complete re-exam not allowed sooner than the third regularly scheduled exam period. See footnote (2)		

Candidates applying for a motor or steam endorsement to a valid Second or Third Assistant Engineer's License are tested in the appropriate steam or motor addendum portions of the examination.

The following modules comprise the appropriate addenda:

THIRD ASSISTANT ENGINEER:

Motor Addendum:	1. Propulsion Diesel Engines, Fuel Oil and Lube Oil Systems
	2. Diesel Engine Cooling, Starting, Intake & Exhaust Systems and Drive Train
Steam Addendum:	1. Boilers, Steam & Water Cycles
	2. Turbine Assemblies, Fuel Oil & Lube Oil Systems

SECOND ASSISTANT ENGINEER:

Motor Addendum:	1. Boilers, Fuel Oil and Combustion Control Systems
	2. Diesel Engines and Associated Diesel Systems
Steam Addendum:	1. Watertube Boilers
	2. Feedwater, Fuel Oil & Combustion Control Systems

EXAMINATION, RETEST AND REEXAMINATION PROCEDURE FOR STEAM OR MOTOR ENDORSEMENTS

Steam or Motor Endorsement - Initial Exam Cycle

IF	THEN	BUT IF	THEN
Unsatisfactory in one section	Must be re-tested only in unsatisfactory section at one of the next three regularly scheduled exam periods. See footnotes (1), (2) and (3).	Unsatisfactory in that section in retest	Considered a complete failure. May be re-examined at any regularly scheduled exam period.

Steam or Motor Endorsement - Initial Exam Cycle

IF	THEN
Unsatisfactory in both sections	Considered to fail complete exam. May be re-examined at any regularly scheduled exam period. See footnote (2).

Second or Subsequent Exam Cycle

IF	THEN	BUT IF	THEN
Unsatisfactory in one section	Must be re-tested only in unsatisfactory section at one of the next three regularly scheduled exam periods. See footnotes (1), (2) and (3).	Unsatisfactory in that section on retest	Considered to fail complete exam. Next re-exam not allowed sooner than the third regularly scheduled exam period.
Unsatisfactory in both sections	Considered complete failure. Next re-exam not allowed sooner than the third regularly scheduled exam period. See footnote (2).		

ISSUANCE OF SINGLE LICENSE QUALIFIED FOR

A candidate being examined for a combined steam and motor license will be administered the entire steam exam and the motor addendum. If the candidate passes that portion of the exam pertaining to one license and is unsatisfactory in that portion pertaining to the other license, the single license qualified for may be issued. A candidate being re-examined for a combined steam and motor license may also be issued a single license if the portion of the exam pertaining to one license is passed. The exam sections in which the candidate may be unsatisfactory and still qualify for a single license are listed as follows. These sections comprise the steam and motor addendum for the various grades of licenses.

Grade and Type of License	Unsatisfactory Section	Qualifies For
Second Assistant Engineer, Steam and Motor	(a) Boilers, Fuel Oil and Combustion Control Systems	Steam License
	(b) Diesel Engines and Associated Diesel Systems	
	(a) Watertube Boilers	Motor License
	(b) Feedwater, Fuel Oil and Combustion Control Systems	
Third Assistant Engineer, Steam and Motor	(a) Propulsion Diesel Engines, Fuel and Lube Oil Systems	Steam License
	(b) Diesel Engines, Cooling, Starting, Intake and Exhaust Systems and Drive Train	
	(a) Boilers, Steam and Water Cycles	Motor License
	(b) Turbine Assemblies, Fuel and Lube Oil Systems	

FOOTNOTES:

(1) If candidate does not appear at one of the next three regularly scheduled exam periods, automatically considered to be a complete failure, must be administered complete re-examination.

(2) Definition of Terms:

Initial Examination - The first examination administered a candidate for a particular grade of license.
Retest - The retest in only those unsatisfactory sections for a candidate who is NOT a complete failure.
Re-examination - The complete re-examination for a candidate who IS a complete failure.

(3) In consideration of the seasonal nature of the Great Lakes shipping which results in the majority of licensing activity taking place just prior to or during spring breakout, the following modification for retests will apply to Great Lakes Ports in the Ninth Coast Guard District only. Retests required during the months of February and March will, if requested, be administered two weeks later rather than one month later.

Conduct in the Examination Room

Individual examination rooms may have slightly different requirements due to local conditions. Candidates will be advised of such local requirements and must comply with them. It is particularly important that candidates not miss any portion of the examination, as each section will be administered only at the scheduled time and if any portion is missed, the examination can be taken only at the next regularly scheduled administration time.

Applicants are not permitted to bring any books, notes, or other reference material into the examination room. All reference material such as publications, regulation books, etc., needed to complete the examination will be provided.

Candidates will be thoroughly briefed on the procedures to be followed during the examination and in the use of the multiple choice answer sheets. These instructions must be carefully followed to insure that the answers are properly recorded and scored.

As each exam section is completed, the test booklet, the answer sheet, and all scrap paper is to be turned in to the examiner before the applicant leaves the room.

Any applicant found to be engaged in any unfair practices during the examination, including referring to concealed notes or communicating with other applicants, will be dismissed from the examination and be considered to have failed the entire examination. Programmable computers and calculators are prohibited.

Additional Information

The following additional information is included later in this publication:

(1) A detailed breakdown of the examination with sample questions
(2) A list of publications available for use in the exam room by the candidate
(3) A bibliography of texts which may be helpful. This cannot be regarded as complete, and failure to list any specific work is not intended to slight its value. Material in the examination has been drawn from other sources as well as the references cited. Reference sources are continually augmented to assure that examination content is compatible with technological and operational advancements.

EXAMINATION SPECIFICATIONS
THIRD ASSISTANT ENGINEER

SUBJECT	STEAM	MOTOR
I. PROPULSION DIESEL ENGINES, FUEL & LUBE OIL SYSTEMS		X
A. Diesel Engines		X
1. Main & Auxiliary Engines		X
2. Internal Engine Lubrication		X
3. Engine Instruments, Alarms & Controls		X
B. Fuel Oil & Fuel Systems		X
1. Fuel Oil & System Interface		X
2. Injection		X
3. Purification		X
4. Transfer & Storage		X
C. Lube Oil & Lube Oil Purification Systems		X
1. Centrifuge		X
2. Full & Bypass Filtration		X
D. General Watch Officer Operations		X
II. DIESEL ENGINES, COOLING, STARTING, INTAKE & EXHAUST SYSTEMS AND DRIVE TRAIN		X
A. Closed Cooling Systems		X
B. Starting Systems		X
1. Direct Cylinder Admission		
2. Air turbine, Hydraulic & Electric Motor		X
3. Aids & Accessories (heaters, H.P. compressors, etc.)		X
C. Intake & Exhaust Systems		
1. Air Intake Systems (natural, turbo-charger, supercharger)		X
2. Exhaust Systems (wet & dry silencers, spark arresters, etc.)		X
D. Drive Train		X
1. Direct drive		X
2. Reduction Gears & Thrust Bearings		X
3. Couplings (resilient, hydraulic, electromagnetic, etc.)		X
4. Electric Drive		X

EXAMINATION SPECIFICATIONS
THIRD ASSISTANT ENGINEER

	SUBJECT	STEAM	MOTOR
III.	AUXILIARY BOILERS, WATER SYSTEMS & ENGINEERING SAFETY		X
	A. Engineering Safety		X
	1. Fire Prevention & Fire Fighting		X
	2. Respiratory & Emergency Equipment		X
	3. Handling of Flammable Liquids		X
	4. Anti-Pollution Control, etc.		X
	B. Potable Fresh & Distilled Water Systems		X
	1. Stowage		X
	2. Evaporation		X
	3. Transfer		X
	C. Auxiliary Boilers		X
	1. Waste Heat Boilers		X
	2. Associated Equipment		X
IV.	AUXILIARY DIESEL ENGINES, WATER SYSTEMS & ENGINEERING SAFETY	X	X
	A. Engineering Safety	X	X
	1. Fire Prevention & Fire Fighting	X	X
	2. Respiratory & Emergency Equipment	X	X
	3. Handling of Flammable Liquids	X	X
	4. Anti-pollution Control, etc.	X	X
	B. Potable Fresh & Distilled Water Systems	X	X
	1. Stowage	X	X
	2. Evaporation	X	X
	3. Transfer	X	X
	C. Auxiliary & Emergency Diesels	X	X
	1. Internal Engine Lubrication	X	X
	2. Engine Alarms, Instruments & Controls	X	X

EXAMINATION SPECIFICATIONS
THIRD ASSISTANT ENGINEER

SUBJECT	STEAM	MOTOR
V. MISCELLANEOUS SYSTEMS	X	X
A. Refrigeration, Air Conditioning & Ventilation	X	X
1. Refrigeration	X	X
a. Fundamentals	X	X
b. Refrigerants	X	X
c. Controls	X	X
d. Refrigeration Cycle	X	X
e. Servicing	X	X
2. Air Conditioning	X	X
a. Principles	X	X
b. Systems	X	X
c. Controls	X	X
3. Ventilation	X	X
B. Sanitary/Sewage, Bilge & Ballast, Steering, Hydraulics & L.P. Air Systems	X	X
1. Sanitary/Sewage	X	X
a. Waste and Trash Disposal	X	X
b. Piping Systems	X	X
2. Bilge & Ballast	X	X
3. Steering Systems	X	X
4. Hydraulics	X	X
5. L.P. Compressed Air	X	X
C. Prints, Tables, Diagrams, Etc.	X	X
1. Engineering Prints	X	X
2. Engineering Tables	X	X
3. Diagrams	X	X
4. Measuring Instruments	X	X
5. Basic Electronics	X	X
VI. ELECTRICITY	X	X
A. Generation	X	X
1. Static	X	X
2. Chemical	X	X
a. Wet cell batteries	X	X
b. Dry cell batteries	X	X
c. Battery maintenance	X	X
3. Mechanical	X	X
a. AC Generators	X	X
b. DC Generators	X	X
c. Voltage Regulation	X	X
B. Current	X	X
1. AC Current	X	X
2. DC Current	X	X
C. Distribution	X	X
1. Circuits	X	X
2. Transformers	X	X
D. Motors	X	X
1. AC Motors	X	X
2. DC Motors	X	X
E. Electrical Safety	X	X

EXAMINATION SPECIFICATIONS
THIRD ASSISTANT ENGINEER

		STEAM	MOTOR
VII.	BOILERS STEAM AND WATER CYCLES	X	
A.	Main and Auxiliary Boilers	X	
	1. Boilers	X	
	2. Combustion Control	X	
	3. Feed Water Control	X	
	4. Water & Steam Flow in Boiler	X	
	5. Desuperheated Steam	X	
	6. Superheated Steam	X	
B.	Closed Feed & Condensate System	X	
C.	General Watch Officer Operations	X	
VIII.	TURBINE ASSEMBLIES, FUEL & LUBE OIL SYSTEMS	X	
A.	Turbine Assemblies	X	
	1. Turbines	X	
	2. Drive Train Mechanical	X	
	a. Reduction Gears	X	
	b. Couplings	X	
	c. Thrust Bearings	X	
	3. Electric Drive	X	
B.	Fuel Oil & Fuel Systems	X	
	1. Fuels & Systems Interfaces	X	
	2. Transfer Systems	X	
	3. Service Systems	X	

EXAMINATION SPECIFICATIONS-THIRD ASSISTANT ENGINEER

I. PROPULSION DIESEL ENGINES, FUEL OIL & LUBE OIL SYSTEMS

1. What causes a direct acting mechanical governor to operate the engine fuel control linkage?

   A. Hydraulic oil pressure
   B. Servomotor action
   C. Flyweight centrifugal force
   D. Relay motion

2. Reducing the clearance between a valve stem and rocker arm will result in the valve

   A. having a shorter open duration.
   B. having a longer open duration.
   C. closing sooner.
   D. opening later.

3. If the back clearance of a piston ring is excessive,

   A. compression pressure in the cylinder will be lower.
   B. carbon will accumulate behind the ring.
   C. combustion gases will penetrate beneath the ring land.
   D. piston side thrust will be increased.

4. Compression and firing pressure heights are measured on indicator draw-cards from the

   I. compression line.
   II. atmospheric line.

   A. I only
   B. II only
   C. Both I and II
   D. Neither I nor II

5. The purifier is usually called a separator

   A. when the principle contaminant is sediment.
   B. if a larger discharge ring is required.
   C. if there is a small amount of oil in the discharged water.
   D. when water is involved in the purification process.

6. If a non-popping, closed fuel injection nozzle is being tested in a nozzle tester and no fuel appears at the spray tip as pressure is built up, you may assume that the

   A. nozzle leak-off is improperly adjusted.
   B. nozzle pintle is bent.
   C. injector needle seat requires cleaning.
   D. needle valve is seating properly.

7. The ability of lubricating oils to resist viscosity changes during temperature changes is indicated by

   A. API number.
   B. viscosity index number.
   C. Seconds Saybolt Furol number.
   D. Seconds Saybolt Universal number.

8. Late fuel oil injection in a diesel engine could result in

   A. fuel knock.
   B. increased power.
   C. low compression pressure.
   D. high exhaust temperature.

9. A substantial increase in crankcase pressure could be an indication of

   A. excessive lube oil pressure.
   B. the proper seating of new rings.
   C. a worn cylinder liner.
   D. a malfunctioning cylinder relief valve.

10. The minimum allowable clearance for a main bearing depends on several factors among which is the

   A. bearing operating temperature.
   B. type of lube oil additives.
   C. amount of anticipated overload.
   D. metallic composition of the housing.

EXAMINATION SPECIFICATIONS-THIRD ASSISTANT ENGINEER

II. DIESEL ENGINES, COOLING, STARTING, INTAKE & EXHAUST SYSTEMS AND DRIVE TRAIN

1. Expansion of the tube bundle in a shell-and-tube type cooler is provided for by the

   A. packing and lantern rings.
   B. floating end tube sheet.
   C. shell foundation bolts.
   D. directional transverse baffles.

2. During starting, exhaust gases are prevented from backing into the air starting system by the

   A. air starting control valve.
   B. individual distribution valves.
   C. cylinder air starting check valves.
   D. high pressure in the starting air manifold.

3. In an unsupercharged diesel engine, air intake volume is directly related to

   A. valve size.
   B. fuel pressure.
   C. compression ratio.
   D. cylinder clearance volume.

4. Which turbocharger component increases air density and helps improve engine operating efficiency?

   A. Impeller
   B. Compressor
   C. Aftercooler
   D. Exhaust diffuser

5. A diesel engine is turned at normal cranking speed with starting air pressure and no ignition occurs. This could be the result of

   A. low lube oil temperature.
   B. low starting air temperature.
   C. air in the fuel-oil system.
   D. water in the starting air system.

6. It is necessary to pause at neutral when changing direction with an Airflex clutch to allow the

   A. fuel rack to readjust.
   B. engine to slow down.
   C. propeller to stop.
   D. clutch to deflate.

7. Kingsbury thrust bearings are lubricated by

   A. flooding the thrust bearing assembly with oil.
   B. submerging oil wiper rings in an oil bath.
   C. pressure lubricating through internal passages.
   D. spraying oil directly on the thrust collar and shoes.

8. Reduction gear teeth that are pitted and have a deep blue color with evidence of overheating have probably been operated with

   A. excessive speed.
   B. improper warm-up.
   C. extreme misalignment.
   D. inadequate lubrication.

9. In a diesel propulsion system, torque is transmitted between the driving and driven members of a fluid coupling by means of a

   A. hydraulic lock between driving and driven members.
   B. metered slippage between driving and driven members.
   C. torque limiting device controlled by engine shaft speed.
   D. hydraulic fluid circulated between driving and driven members.

10. If an air start diesel engine begins to rotate in the wrong direction when starting air is applied,

   A. one or more fuel valves is leaking.
   B. the starting air valve did not open completely.
   C. one or more starting air valves is leaking.
   D. the starting air pressure is too low.

EXAMINATION SPECIFICATIONS-THIRD ASSISTANT ENGINEER

III. AUXILIARY BOILERS, WATER SYSTEMS & ENGINEERING SAFETY

1. The maximum pressure developed by a waste-heat boiler is determined by engine exhaust

   A. gas composition.
   B. pressure.
   C. timing.
   D. temperature.

2. What condition would cause a boiler to "pant"?

   A. A leaking tube
   B. Insufficient feedwater
   C. Too much air
   D. Too little air

3. Generating tubes on waste-heat boilers are finned to

   A. prevent stack fires.
   B. prevent exhaust gas corrosion.
   C. increase the rate of combustion.
   D. increase the rate of heat transfer.

4. In a flash distilling unit, evaporator feed (seawater) first absorbs heat in the

   A. distillate cooler.
   B. vapor-feed heater.
   C. air-ejector condenser.
   D. salt water heater.

5. An evaporator is classified as a (an)

   A. auxiliary boiler.
   B. fired pressure vessel.
   C. auxiliary condenser.
   D. unfired pressure vessel.

6. The temperature at which the vapor being given off by a substance will ignite spontaneously in the air is called the

   A. spontaneity point.
   B. ignition temperature.
   C. fire temperature.
   D. flash point.

7. The only fuel that should be used in a flame safety lamp is

   A. naptha.
   B. alcohol.
   C. lighter fluid.
   D. white gasoline.

8. To prevent a possible oil spill after fuel tanks have been topped off, you should

   A. check frequently to make certain that the level is not rising.
   B. seal the tanks to prevent contamination.
   C. mark the tanks with a "bull" on the manifold filling valve.
   D. set the pressure vacuum relief valve.

IV. AUXILIARY DIESEL ENGINES, WATER SYSTEMS & ENGINEERING SAFETY

1. A jerk-type fuel pump used on some auxiliary diesel engines controls the delivery cut-off point with a

   A. delivery valve spring.
   B. spill port for leak-off.
   C. check valve in the guide.
   D. helical groove on the plunger.

2. Which method is normally used to lubricate bearings in a small, high speed diesel engine?

   A. Splash lubrication
   B. Pressure lubrication
   C. Sight feed lubricators
   D. Mechanical lubricators

3. If an auxiliary diesel engine makes black smoke and fails to develop full power, the cause could be

   A. light fuel injection.
   B. low cooling water temperature.
   C. high ambient air temperature.
   D. a leaking cylinder head gasket.

4. The exact location of a vessel's fire hydrants and associated equipment is indicated on the

   A. Certificate of Inspection.
   B. bridge card.
   C. firefighting key plan.
   D. saltwater service piping plan.

5. In a soloshell, double-effect distilling unit, the evaporator feed in the second-effect is heated by

   A. auxiliary steam.
   B. air ejector steam.
   C. first-effect distillate.
   D. flash chamber leak-off.

6. What condition is likely to result if the brine concentration is too high in a distilling unit?

   A. Loss of evaporator capacity
   B. Increased scaling
   C. Increased distillate quality
   D. Poor vacuum control

7. To safely enter a compartment where the atmosphere is unknown, you should test with an explosimeter and

   A. carry a flame safety lamp.
   B. wear a fresh-air hose mask.
   C. wear a cannister type gas mask.
   D. inert the compartment atmosphere.

8. Burning diesel oil should be treated as what class of fire?

   A. Class A
   B. Class B
   C. Class C
   D. Class D

V. MISCELLANEOUS SYSTEMS

1. In a refrigerant system, which will occur first when the refrigerated space reaches the desired temperature?

   A. The solenoid valve will close.
   B. The expansion valve will open.
   C. The low-pressure cut-out switch will stop the compressor.
   D. The high-pressure cut-out switch will stop the compressor.

2. A thermostatic expansion valve functions primarily to control the

   A. refrigerated space temperature.
   B. compressor suction pressure.
   C. vapor discharge pressure in the cooling coils.
   D. quantity of refrigerant in the cooling coils.

3. Which device is used to measure the humidity in a humidity control system?

   A. Hydrometer
   B. Manometer
   C. Barometer
   D. Psychrometer

4. Modern marine sanitary systems use fresh water rather than salt water because of

   A. fewer maintenance problems.
   B. lower initial installation costs.
   C. environmental protection requirements.
   D. sanitation and health requirements.

5. Accidental flooding of the engine room bilge from the bilge main is prevented by

   A. installing a swing check before each bilge valve.
   B. using a positive displacement bilge pump.
   C. installing eductors in all bilge rose boxes.
   D. stop check valves on the bilge suction manifolds.

6. If a power failure in the steering motors occurs, the rudder can be moved with

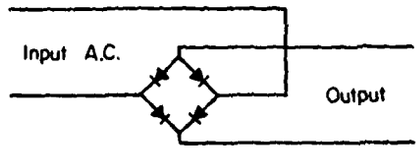
   A. the emergency steering station.
   B. the ram by-pass valves.
   C. hand pump steering.
   D. trick wheel steering.

7. The use of oil having a higher viscosity than specified can cause which problem in a hydraulic system?

   A. Seal leakage
   B. Fast response and hunting
   C. Increased power consumption
   D. Oil film breakdown

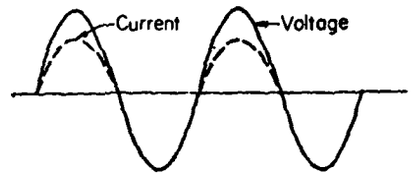
8. The unloading system on an air compressor will

   A. increase compressor discharge pressure on demand.
   B. increase compressor operating speed as necessary.
   C. reduce the compressor motor load when starting.
   D. reduce the compressor friction load when starting.



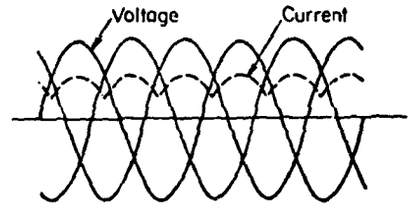
9. Which of the following wave forms would result from the circuit above?

(A)

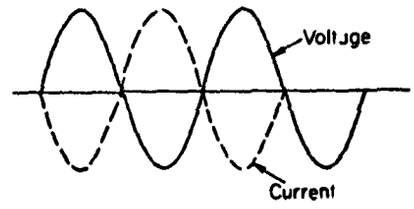


(B)

(C)



(D)



10. The function of a rectifier is similar to that of an electrical

A. stop valve.
B. check valve.
C. regulating valve.
D. throttling valve.

VI. ELECTRICITY

1. During charging, lead-acid batteries should be well ventilated because

A. without ventilation, there will be excessive "gassing".
B. highly poisonous gases are released.
C. highly explosive gases are released.
D. without ventilation, the battery will not take a full charge.

2. Which substance should be applied to battery terminals to help prevent corrosion?

A. Zinc chromate
B. Naval jelly
C. Lead peroxide
D. Petroleum jelly

3. Equal power factors on AC generators are maintained automatically by the

A. governor control switch.
B. reverse power relay.
C. reverse current relay.
D. voltage regulator.

4. The need for shifting the brushes of a DC generator as its load changes has been eliminated by the use of

A. interpoles.
B. damper windings.
C. compensating windings.
D. larger brushes.

5. After you close the circuit breaker to parallel two alternators, the next step is to balance the

   A. power factor.
   B. reactive power.
   C. K.W. loads.
   D. ampere loads.

6. Which meter uses a shunt connected in series with the load and parallel with the meter movement?

   A. Voltmeter
   B. Power factor meter
   C. Wattmeter
   D. Ammeter

7. Before performing any work on electrical or electronic equipment, you should

   A. remove the fuse from the circuit.
   B. by-pass the interlocks.
   C. secure and tag the circuit supply switch in the open position.
   D. station a man at the circuit supply switch.

8. When the operating handle of a molded-case circuit breaker is in the midposition, it indicates that the circuit breaker is

   A. on.
   B. off.
   C. reset.
   D. tripped.

9. A synchronous motor is not self-starting due to

   A. its lack of a rotating magnetic field.
   B. the inertia of the rotor.
   C. magnetic locking action between rotor and stator field.
   D. its low power factor.

10. The purpose of interpoles on D.C. motors is to

   A. provide greater torque by strengthening the main field.
   B. provide sparkless commutation without shifting the brushes.
   C. limit the production of counter electromotive force.
   D. limit the starting surge current.

EXAMINATION SPECIFICATIONS-THIRD ASSISTANT ENGINEER

VII BOILERS; STEAM AND WATER CYCLES

1. Downcomers in watertube boilers function to

   A. distribute feedwater within the waterdrum.
   B. decrease the end point for moisture carryover.
   C. cool the tubes adjacent to the burner throats.
   D. ensure proper circulation to the water wall headers.

2. Insufficient combustion air supply to the furnace would cause

   A. the fires to sputter.
   B. low superheater outlet temperature.
   C. high stack temperature.
   D. high feedwater consumption.

3. In a boiler equipped with an automatic feedwater regulator, erratic variations in the water level could be caused by

   A. high solids content and foaming in the drum.
   B. ruptured feedwater control valve diaphragm.
   C. fluctuating D.C. heater water level.
   D. high feedwater temperature.

4. To minimize boiler damage if a waterwall tube suddenly fails, and the water level begins to fall very slowly, you should continue the feedwater supply and immediately

   A. reduce the firing rate of the boiler.
   B. secure the forced draft fans.
   C. secure the boiler.
   D. gag the drum safety valves to prevent steam loss.

5. Oxygen entrained in the feedwater entering a boiler can cause

   A. caustic embrittlement.
   B. localized pitting.
   C. honeycombing.
   D. erosion.

6. The piping of steam soot blowers should be drained thoroughly before using to prevent

A. accidental flameout.
B. feedwater losses.
C. nozzle plugging.
D. erosion.

7. What precaution should you take before blowing down a waterwall header?

A. Relieve the pressure and cool down the boiler
B. Raise the water level above the surface blow
C. Take the boiler out of service
D. Reduce the firing rate of the boiler to its minimum

8. Boiler screen tubes protect which component from high furnace temperatures?

A. Superheater
B. Refractory
C. Wall tubes
D. Steam drum

9. The burner assembly diffuser controls the

A. flow of fuel oil in the whirling chamber.
B. shape of the fuel oil cone.
C. amount of air entering near the atomizer tip.
D. fuel oil back pressure.

10. An indication of excessive soot on boiler heating surfaces is

A. high stack temperature.
B. high water level.
C. decreased fuel oil consumption.
D. decreased draft pressure.

EXAMINATION SPECIFICATIONS-THIRD ASSISTANT ENGINEER

VIII. TURBINE ASSEMBLIES, FUEL OIL & LUBE OIL SYSTEMS

1. The dummy piston and cylinder in a multi-stage reaction turbine function to

   A. reduce axial thrust.
   B. balance the rotor.
   C. eliminate the pressure drop across the blades.
   D. provide a means of measuring axial clearances.

2. A turbine diaphragm functions to

   A. support moving blades and shrouding in an impulse turbine.
   B. provide support for interstage packing in a reaction turbine.
   C. support the nozzles and guide the flow of steam in an impulse turbine.
   D. decrease steam velocity in the nozzles of an impulse turbine.

3. A nozzle in an impulse turbine functions to

   A. reverse steam flow direction.
   B. guide the steam through the fixed blades.
   C. decrease the velocity of steam.
   D. control turbulent steam expansion.

4. Throttling losses in a turbine propulsion plant could be caused by

   A. high steam chest pressure.
   B. nozzle valves being jammed closed.
   C. nozzle valves being not fully seated.
   D. moisture entrained in the steam.

5. Double helically cut gears are used for main reduction and pinion gears to

   A. decrease reduction gear radial bearing loads.
   B. reduce end thrust and gear noise.
   C. decrease the number of teeth in contact.
   D. increase tooth deflection at high speeds.

6. The presence of sulphur in fuel oil will most likely cause

   A. a decrease in the ability of the oil to be properly atomized.
   B. an excessive heat content per unit of volume.
   C. heavy slag formation on refractory.
   D. corrosion on the firesides of the boiler.

7. What action should the watch engineer take if there is no oil visible in the gravity tank overflow line bullseye?

   A. Slow the engines and call the chief engineer.
   B. Shift to a clean lube oil strainer and then notify the chief engineer.
   C. Stop the engines and notify the bridge.
   D. Shift to the standby lube oil pump and notify the bridge.

8. The maximum temperature rise of oil passing through any reduction gear or bearing should generally not exceed

   A. 30°F.
   B. 50°F.
   C. 70°F.
   D. 90°F.

9. Which of the following determines the temperature to which fuel oil must be heated for proper atomization?

   A. Viscosity
   B. Flash point
   C. Pour point
   D. Specific gravity

10. What condition would cause only one burner solenoid valve to close on an automatically fired, two burner boiler?

   A. Loss of the forced draft fan
   B. Low boiler water level
   C. High boiler water level
   D. A faulty coil in the solenoid valve

EXAMINATION SPECIFICATIONS
SECOND ASSISTANT ENGINEER

SUBJECT	STEAM	MOTOR
I. Boilers, Fuel Oil & Combustion Control Systems		X
A. Boilers		X
1. Waste Heat Boilers		X
2. Auxiliary Boilers		X
a. Automatic Auxiliary Boilers		X
b. Automatic Controls		X
c. Feed water Conditioning		X
d. Water & Steam Flow in Boilers		X
B. Steam Fuel Oil Systems & Fuel Oil Characteristics		X
C. Fuel Oil Combustion Process & Combustion Systems		X
1. Flue Gas Analysis		X
II. Diesel Engines and Associated Diesel Systems		X
A. Main & Auxiliary Engines		X
B. Closed Cooling Systems		X
C. Starting Systems		X
D. Fuel Oil Injection Systems		X
E. Associated Diesel Systems		X
1. Air Intake & Exhaust Systems		X
2. Fuel Oil Systems, Fuel Oil Characteristics & Stack Gas Analysis		X
3. Lube Oil & Lube Oil Purification Systems		X
4. Drive Trains		X
5. Watch Officer Operations		X
III. Review	X	X
A. Electricity	X	X
1. Mechanical Generation	X	X
2. Distribution	X	X
3. Motors	X	X
B. Miscellaneous Systems	X	X
1. Refrigeration, Air Conditioning, ventilation	X	X
2. Sanitary, Sewage, Bilge & Ballast	X	X
3. Steering, Hydraulics & L.P. Air	X	X
4. Prints, Tables, Instruments & Electronics	X	X
C. Turbine Assemblies	X	
D. Lube Oil & Systems	X	
E. Auxiliary Diesel Engines	X	

EXAMINATION SPECIFICATIONS-SECOND ASSISTANT ENGINEER

SUBJECT	STEAM	MOTOR
IV. Engineering Safety	X	X
A. Bunkering (Safety & Anti-pollution control)	X	X
B. General (Rules & Regulations)	X	X
C. Fire Prevention & Fighting, Respiratory & Emergency Equipment, Handling Flammable Liquids, etc.	X	X
V. Water tube boilers	X	
A. Main & Auxiliary Water Tube Boilers, Steam & Water Cycle	X	
VI. Feed Water, Fuel Oil & Combustion System	X	
A. Feed Water System	X	
B. Water Conditioning as a process-Problems & effects in system	X	
C. Fuel Oil Systems & Fuel Oil Characteristics	X	
D. Fuel Oil Combustion Process & Combustion Systems	X	
E. Flue Gas Analysis	X	
VII. Motor Review		X
A. Electricity		X
1. Mechanical Generation		X
2. Distribution		X
3. Motors		X
B. Miscellaneous Systems		X
1. Refrigeration, Air Conditioning, Ventilation		X
2. Sanitary, Sewage, Bilge & Ballast		X
3. Steering, Hydraulics & L.P. Air		X
4. Prints, Tables, Instruments & Electronics		X

EXAMINATION SPECIFICATIONS-SECOND ASSISTANT ENGINEER

I. BOILERS, FUEL OIL & COMBUSTION CONTROL SYSTEMS

1. A secondary function of a waste heat boiler is to

A. reduce engine exhaust noise.
B. reduce engine back pressure.
C. increase engine cycle efficiency.
D. increase turbocharger efficiency.

2. A common method of varying the steam generating rate of a firetube waste heat boiler is by

A. varying the boiler water level.
B. diluting the hot exhaust gases with cool air.
C. spraying controlled amounts of water into the exhaust gases.
D. varying the circulation of water through the boiler.

3. Ignition failure in an automatically controlled auxiliary boiler can be caused by

A. carbon deposits on the electrodes.
B. excessive fuel oil temperature.
C. excessive return oil pressure.
D. insufficient air for combustion.

4. As the pH value of boiler water approaches zero, the water becomes increasingly

A. neutral.
B. acidic.
C. soft.
D. alkaline.

5. In a boiler steam and water system, pressure is highest in the

A. steam stop.
B. dry pipe.
C. feed line.
D. mud drum.

6. What step should you take first in the event the water in the gage glass goes out of sight and the burner fails to secure automatically?

A. Blowdown the gage glass
B. Secure the fires
C. Increase feed pump speed
D. Repair the feedwater regulator

EXAMINATION SPECIFICATIONS-SECOND ASSISTANT ENGINEER

7. A smoking burner in an automatic auxiliary boiler would be caused by

   A. defective solenoid valve.
   B. dirty fuel nozzle.
   C. grounded high tension lead.
   D. faulty ignition cable connector.

8. Automatic combustion control systems are designed to prevent immediate burner firing on boilers after a normal or safety shutdown to allow time for

   A. the furnace to be purged.
   B. electric charge buildup in the igniter.
   C. the fuel pump to start.
   D. the drum level to equalize.

9. To obtain the most accurate results from chemical testing, a boiler water sample should be taken

   A. after the boiler has been blown down.
   B. before the boiler has been blown down or chemicals added.
   C. when the boiler has been refilled with make-up feed.
   D. from the highest point in the feed system.

10. In a forced circulation auxiliary boiler, steam is formed in the

   A. heating coils.
   B. steam accumulator or flash chamber.
   C. hot well.
   D. thermostat tube.

II. DIESEL ENGINES AND ASSOCIATED DIESEL SYSTEMS

1. If the compression rings on a diesel engine piston become stuck, the cause may be

   A. excessive cylinder pressure.
   B. excessive cylinder lubrication.
   C. improper ring rotation.
   D. improper ring action.

2. The reversing cams in some four-stroke cycle diesel engines are brought into position by

   A. rotating the cam 180°.
   B. shifting the cam followers.
   C. sliding the camshaft vertically.
   D. movable idler sprockets in the drive chain.

3. Bearing clearances in small high speed diesel engines should be measured with

   A. gauge blocks.
   B. plastigage.
   C. feeler gages.
   D. round solder wire.

4. In a single-acting, two-stroke cycle diesel engine, the power impulse in an individual cylinder occurs

   A. once every crankshaft revolution.
   B. once every two crankshaft revolutions.
   C. once every piston stroke.
   D. twice every piston stroke.

5. When the opening pressure of a diesel fuel injector is lower than that specified by the engine manufacturer, the

   A. quantity of fuel injected tends to be increased.
   B. quantity of fuel injected will always be decreased.
   C. start of injection will always be retarded.
   D. duration of injection will always be reduced.

6. Between injection and ignition of the fuel, a diesel engine crankshaft rotates through the

   A. detonation period.
   B. firing period.
   C. delay period.
   D. advance period.

7. Individual cylinder performance in a diesel engine is commonly determined by exhaust gas

   A. pyrometer readings.
   B. chemical analysis.
   C. pressure readings.
   D. infrared analysis.

8. A decrease in the flash point of lube oil indicates the lube oil is

   A. diluted with fuel oil.
   B. diluted with water.
   C. contaminated with carbon.
   D. contaminated with sludge.

EXAMINATION SPECIFICATIONS-SECOND ASSISTANT ENGINEER

9. A characteristic of rubber or neoprene stern tube bearings is

A. the bearings are lubricated by seawater.
B. no stern tube packing is required.
C. neoprene bearings are less abrasion resistant than bronze bearings.
D. neoprene bearings are not damaged by propeller shaft vibration.

10. Turbulence in the combustion chambers of a diesel engine is induced by

A. delayed ignition.
B. increased clearance volume.
C. directional intake ports.
D. multi-orificed fuel nozzles.

III. REVIEW

1. Which statement is true concerning simple parallel resistance circuits?

A. The voltage across each resistance is the same.
B. The total current flow equals the reciprocal of the sum of the individual curre
C. The total resistance equals the sum of the individual resistances.
D. The total voltage equals the sum of the individual voltages across each resista

2. The purpose of a main switchboard circuit breaker reverse-power trip is to

A. prevent main circuit overload.
B. protect the circuit breaker blowout coil.
C. prevent generator motorization.
D. prevent low voltage trip-out.

3. Most main propulsion unit reduction gear bearings are

A. self-lubricating.
B. self-aligning.
C. spherically seated.
D. rigidly mounted.

4. If the main turbine bearing lube oil pressure suddenly drops to zero, you should

A. stop the turbine rotor until the lube oil pressure is restored.
B. reduce turbine rotor speed until lube oil sump level returns to normal.
C. start the standby pump and reduce turbine rotor speed.
D. start the standby pump and gravitate oil from the gravity tank.

EXAMINATION SPECIFICATIONS-SECOND ASSISTANT ENGINEER

5. Relief valves on hydraulic steering gear pumps function to

   A. protect the pumps from excessive pressures.
   B. prevent the rudder from exceeding 45° movement in either direction.
   C. prevent damage to the transmitter unit.
   D. relieve the gear from rudder shock by acting as buffers.

6. During the power stroke of a 4-stroke cycle diesel engine, most of the side thrust of a trunk piston connecting rod is absorbed by the

   A. piston skirt.
   B. pinion.
   C. crosshead.
   D. compression rings.

7. The purpose of a refrigeration system low-pressure cutout switch is to

   A. protect the compressor from low suction pressure.
   B. protect the compressor from low discharge pressure.
   C. start and stop the compressor upon system demands.
   D. start the compressor after a drop in the evaporator pressure.

8. The delivery rate of an axial piston hydraulic pump is controlled by varying the position of the

   A. slide block.
   B. tilting box.
   C. pintle.
   D. reaction ring.

9. A three-phase, squirrel cage induction motor could run hot due to

   A. clogged ventilating ducts.
   B. an open stator coil.
   C. an uneven air gap.
   D. a high power factor.

10. Lantern rings are provided on centrifugal pumps to

   A. allow visual inspection of shaft and packing.
   B. cool the shaft and packing.
   C. adjust leakage at the shaft gland.
   D. prevent air leakage into the pump casing.

EXAMINATION SPECIFICATIONS-SECOND ASSISTANT ENGINEER

IV. ENGINEERING SAFETY

1. When petroleum products are handled, static electricity can be generated by

   A. splashing or agitation.
   B. excessive pressure.
   C. low temperatures.
   D. low viscosity.

2. A vessel's stability may be improved by

   A. keeping the fuel tanks topped off.
   B. increasing the free surface effect.
   C. keeping fuel tanks at least half full.
   D. keeping at least one fuel tank empty for slops.

3. Which equipment should you use when entering a fuel tank before it is certified gas free?

   A. Flame safety lamp
   B. Canister gas mask
   C. Fresh air mask
   D. Combustible gas indicator

4. A fire fighter's outfit on a cargo vessel must have a

   A. canister-type gas mask.
   B. fresh-air breathing apparatus.
   C. self-contained breathing apparatus.
   D. combustible gas indicator.

5. Flame screens used on ullage openings prevent flames from entering a tank by

   A. reducing the cross sectional area of the opening.
   B. restricting the flow of gases through the opening.
   C. a baffling process which turns the flames.
   D. dissipating heat from flames into the surrounding metal.

6. A portable foam fire extinguisher must be recharged every

A. 3 months.
B. 6 months.
C. 9 months.
D. 12 months.

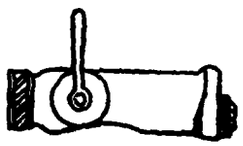
7. Repairs to boiler safety valves can be made by

I. the Chief Engineer in an emergency.
II. any repair facility approved by the Coast Guard.

A. I only
B. II only
C. Both I and II
D. Neither I nor II

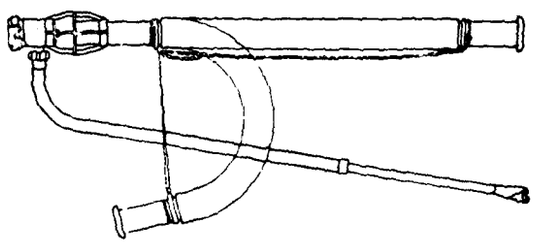
8. With the handle in the position shown below, the nozzle would deliver

A. a fog.
B. a spray.
C. a solid stream.
D. no flow.



9. The device shown below is a (an)

A. suicide nozzle.
B. all-purpose nozzle.
C. fog applicator.
D. mechanical foam nozzle.



EXAMINATION SPECIFICATIONS-SECOND ASSISTANT ENGINEER

10. Coast Guard Regulations require that lighting fixture globes must be protected by guards if the fixtures are located in the

A. living quarters.
B. cargo holds.
C. wheelhouse.
D. galley.

VI. WATERTUBE BOILERS

1. Excessive soot deposits on the heating surfaces of an uncontrolled, interdeck superheater boiler would be indicated by

A. decreased fuel oil and air requirements.
B. decreased stack temperature.
C. increased desuperheated steam temperature.
D. decreased superheater outlet temperature.

2. In a huddling chamber type safety valve, the initial valve opening is caused by

A. static pressure acting on the compression screw.
B. steam pressure acting on the increased surface area of the projecting feather.
C. steam flow passing through the calibrated adjusting ring.
D. steam pressure acting on the bottom area of the valve disc.

3. If a tube failure results from low water level and you cannot maintain water in sight in the gage glass, you should

A. immediately secure the forced draft fans.
B. increase the feed pump speed to maximum.
C. immediately secure the fuel oil supply to the burners.
D. blow down the gage glass to verify a low water condition.

4. Panting in an oil fired marine boiler could be caused by

A. excessive combustion air supply.
B. low fuel oil temperature.
C. fouled burner sprayer plates.
D. insufficient combustion air supply.

5. A control desuperheater is installed in a modern marine boiler to control

A. superheater steam flow.
B. desuperheated steam temperature.
C. superheater inlet temperature.
D. superheated steam temperature.

6. An important consideration in the prevention of carry-over in a marine boiler is to

   A. properly treat the boiler water with hydrazine.
   B. control the amount of boiler water solids.
   C. maintain a high boiler water level.
   D. add foaming agents to the boiler water.

7. Spalling of boiler furnace brickwork is caused by

   A. thermal shock.
   B. impurities in the fuel oil.
   C. excessive firing rates.
   D. faulty wall construction.

8. You should replace the refractory on a burner front when the slag accumulation causes

   A. the burner flame patterns to be distorted.
   B. slight radial cracking around the burner cones.
   C. the flame scanner to sense false signals from glowing brickwork.
   D. overheating of the burner atomizer tips.

9. The process of flaring the section of a boiler tube that extends beyond the tube sheet into the drum is known as

   A. safe ending.
   B. expanding.
   C. belling.
   D. breeching.

10. What could result if a boiler tube bank baffle carried away or burned through?

   A. Incomplete combustion
   B. Localized overheating of the water drum
   C. Excessive gas turbulence in the furnace
   D. Fireside burning of boiler tubes

VI. FEEDWATER, FUEL OIL & COMBUSTION CONTROL SYSTEMS

1. An automatic, two-element, boiler feedwater regulator is controlled by

   A. drum water level and drum pressure.
   B. drum water level and feedwater flow.
   C. steam flow and feedwater flow.
   D. steam flow and drum water level.

EXAMINATION SPECIFICATIONS-SECOND ASSISTANT ENGINEER

2. Sodium phosphate in boiler water can be measured by a (an)

   A. alkalinity test.
   B. phosphate test.
   C. chlorinity test.
   D. calcium hardness test.

3. The end products of reactions that occur when boiler water is chemically treated remain in the boiler and increase the need for

   A. acid cleaning.
   B. make-up feed.
   C. boiler blowdown.
   D. waterside corrosion treatment.

4. Fuel oil accumulations in a boiler double front is caused by

   A. leaking fuel oil strainers.
   B. partially plugged atomizers.
   C. dripping atomizers.
   D. insufficient air.

5. Scale prevention in boiler water is accomplished by adding treatment chemicals that

   A. precipitate scale forming salts as sludge.
   B. solidify the scale as a powder.
   C. increase boiler water acidity.
   D. cause the water to be neutral.

6. If the temperature of fuel entering an atomizer is too low, the burner will

   A. dribble fuel and smoke white.
   B. require more fuel for atomization.
   C. require more excess air for combustion.
   D. smoke heavily at any load condition.

7. The efficiency of boiler combustion can be measured by the relative proportions of certain flue gases. The measured gases are

   A. nitrogen, carbon dioxide, and oxygen.
   B. nitrogen, carbon monoxide, and oxygen.
   C. carbon dioxide, carbon monoxide, and oxygen.
   D. nitrogen, carbon dioxide, and carbon monoxide.

EXAMINATION SPECIFICATIONS-SECOND ASSISTANT ENGINEER

8. What constituent of fuel oil determines the specific heat?

   A. Hydrocarbons
   B. Sulphur
   C. Nitrogen
   D. Oxygen

9. The boiler feedwater control valve varies the unity relationship between steam and water flow during periods of

   A. minimum boiler load.
   B. steady boiler load.
   C. load change.
   D. overload operation.

10. The temperature of fuel oil received is critical in determining the

   A. expansion space to leave in a tank.
   B. flash point at which the fuel will burn.
   C. temperature to which the fuel must be heated.
   D. rate at which the fuel may be received.

EXAMINATION SPECIFICATIONS

LIST OF MATERIALS

This list gives the materials that will be available for use by the candidate in the examination room.

46 CFR, Parts 30-40, Rules and Regulations for Tank Vessels
46 CFR, Parts 50-64, Marine Engineering Regulations
46 CFR, Parts 70-89, Rules and Regulations for Passenger Vessels
46 CFR, Parts 90-105, Rules and Regulations for Cargo Vessels
46 CFR, Parts 110-113, Electrical Engineering Regulations
46 CFR, Parts 140-149, Dangerous Cargoes
Oil Pollution Control for Tankermen

STUDY BIBLIOGRAPHY FOR THIRD AND SECOND ASSISTANT ENGINEER

Engineering Technical Drafting & Graphics, 3rd Ed.
J.W. Giachino & H. J. Beukema
American Technical Society LCCCN 75-173653

Programmed Blueprint Reading, 2nd. Ed.
Coover-Helsel
McGraw-Hill Book Company

Modern Marine Engineers Manual, Vols, I and II
Osbourne (1965 Ed)
Cornell Maritime Press, Inc. LCCCN 65-18208

Marine Engineering, Vols, I and II
Seward
SNAME

Combustion Engineering, Revised Edition
G.R. Fryling
Combustion Engineering, Inc. LCCCN 66-23939

Steam, Its Generation and Use, 1972 Ed.
Babcock and Wilcox Company LCCCN 55-2812

Modern Marine Engineering, Vols. 1-2-3, MEBA

Fundamentals of Steam Generators as Applied to Marine Propulsion Power Plants, MEBA

Naval Boilers
Latham
United States Naval Institute

Naval Turbines
United States Naval Institute

Introduction to Marine Engineering
Latham
United States Naval Institute

Naval Auxiliary Machinery
United States Naval Institute

Internal Combustion Engines
Gill, Smith and Ziurys
United States Naval Institute LCCCN 59-3873

Diesel Engineering Handbook, 12th Ed.
K.W. Stinson
Business Journals, Inc.

Diesel Engine Operation and Maintenance
Maleev
McGraw-Hill Book Company, Inc. LCCCN 53-12431

Internal Combustion Engines and Air Pollution
E.F. Obert
Intext Educational Publishers LSBN 0-7002-2183-2

Electric Circuits and Machines, 4th Ed.
Lister
McGraw-Hill Book Company, Inc. LCCCN 68-13519

Preventive Maintenance of Electrical Equipment, 2nd. Ed.
C. I. Hubert
McGraw-Hill Book Company, Inc. LCCCN 69-13221

Electric Motor Control Fundamentals, 2nd. Ed.
McIntyre
McGraw-Hill Book Company, Inc. LCCCN 66-21866

Electricity for Marine Engineers, MEBA

Basic Electronics, 3rd Ed.
Grob
McGraw-Hill Book Company, Inc. LCCCN 76-141919

Industrial Instrument Servicing Handbook, 1st Ed.
G. C. Carroll
McGraw-Hill Book Company, Inc. LCCCN 59-8532

Deck Machinery
P.D.W. Smith
Cornell Maritime Press, Inc. LCCCN 73-12704

Modern Marine Electricity and Electronics
P.D.W. Smith
Cornell Maritime Press, Inc. LCCN 66-20886

Modern Refrigeration and Air Conditioning
Althouse, Turnquist and Bracciano
The Goodheart-Wilcox Company, Inc. LCCCN 67-29520

Commercial and Industrial Refrigeration
C.W. Nelson
McGraw-Hill Book Company, Inc. LCCN 52-6545

Handbook of Air Conditioning System Design
Carrier Air Conditioning Company
McGraw-Hill Book Company, Inc.

Refrigeration and Air Conditioning, 2nd. Ed.
Jordan and Priester
Prentice-Hall Inc. LCCCN 56-12183

Basic Applied Fluid Power
J. Oster
McGraw-Hill Book Company, Inc. LCCCN 68-15738

Simplified Hydraulics
L. S. McNickle, Jr.
McGraw-Hill Book Company, Inc. LCCN 65-25048

Pump Operation and Maintenance
T. G. Hicks
McGraw-Hill Book Company, Inc. LCCCN 57-11860

Centrifugal Pumps, Selection, Operation and Maintenance
I. Karassik and R. Carter
McGraw-Hill Book Company, Inc. LCCN 60-16693

Machine Tool Metalworking, Principles and Practice
Feirer and Tatro
McGraw-Hill Book Company, Inc. LCCCN 60-13765

Welding Engineering
B. E. Rossi
McGraw-Hill Book Company, Inc. LCCCN 52-12362

Standard Welding Symbols and Rules for Their Use
American Welding Society

Modern Ships
LaDage
Cornell Maritime Press LCCCN 64-21747

Gear Handbook, 1st Ed. LCCCN 61-7304
Dudley
McGraw-Hill Book Company, Inc.

COAST GUARD DISTRICT COMMANDERS AND MERCHANT MARINE ACTIVITIES

District	Title	City	State	Address
1st	Commander, 1st Coast Guard District	Boston	Massachusetts 02114	150 Causeway St.
	Chief, Merchant Marine Safety Division	do	do	do
	*Commanding Officer, Marine Safety Office	do	Massachusetts 02109	447 Commercial St.
	*do	Portland	Maine 04112	P.O. Box 108 Downtown Station
	do	Providence	Rhode Island 02903	Federal Bldg. & USPO Exchange St.
2nd	Commander, 2nd Coast Guard District	St. Louis	Missouri 63103	Federal Bldg. 1520 Market St.
	Chief, Merchant Marine Safety Division	do	do	do
	*Commanding Officer, Marine Safety Office	do	Missouri 63101	Suite 1120 210 N. 12th St.
	do	Paducah	Kentucky 42001	P.O. Box 1400, Avondale Station
	do	Dubuque	Iowa 52001	Box 695
	do	Cincinnati	Ohio 45202	Room 4020, Federal Office Bldg., 550 Main Street
	do	Louisville	Kentucky 40201	P.O. Box 1153
	do	Memphis	Tennessee 38103	Suite 1134, 100 N. Main Bldg.
	do	Nashville	Tennessee 37203	Rm. A-935, U.S. Courthouse Annex
	do	Pittsburgh	Pennsylvania 15222	312 Stanwix St.
	do	Huntington	West Virginia 23725	P.O. Box 2412
3rd	Commander, 3rd Coast Guard District	New York	New York 10004	Governors Island
	Chief, Merchant Marine Safety Division	do	do	do
	*Officer in Charge, Marine Inspection	do	do	Battery Park Bldg.
	*do	Philadelphia	Pennsylvania 19106	Customhouse
	Commanding Officer, Marine Safety Office	Albany	New York 12207	Leo W. O'Brien Federal Bldg. Clinton Ave. & North Pearl St.

COAST GUARD DISTRICT COMMANDERS AND MERCHANT MARINE ACTIVITIES

District	Title	City	State	Address
5th	Commander, 5th Coast Guard District	Portsmouth	Virginia 23705	Federal Bldg., 431 Crawford St.
	Chief, Merchant Marine Safety Division	do	do	do
	*Commanding Officer, Marine Safety Office	Norfolk	Virginia 23510	300 East Main St.
	do	Wilmington	North Carolina 28401	P.O. Box 343
	*do	Baltimore	Maryland 21202	Customhouse
7th	Commander, 7th Coast Guard District	Miami	Florida 33130	Federal Bldg. 51 Southwest 1st Ave.
	Chief, Merchant Marine Safety Division	do	do	do
	*Officer in Charge Marine Inspection	do	do	111 S.W. 3rd St.
	*Commanding Officer Marine Safety Office	Old San Juan	Puerto Rico 00904	Box 3666
	*do	Tampa	Florida 33601	P.O. Box 3172
	do	Savannah	Georgia 31402	P.O. Box 8191
	*do	Jacksonville	Florida 32206	Room 213, 2701 Talleyrand Ave
	*do	Charleston	South Carolina 29403	Room 625, Federal Bldg, 334 Meeting Street
8th	Commander, 8th Coast Guard District	New Orleans	Louisiana 70130	Customhouse
	Chief, Merchant Marine Safety Division	do	do	do
	*Officer in Charge, Marine Inspection	do	Louisiana 70112	Canal LaSalle Bldg. Suite 2300, 1400 Canal St.
	*do	Mobile	Alabama 36602	2000 Federal Office Bldg.
	*do	Houston	Texas 77011	7300 Wingate St.
	*Commanding Officer, Marine Safety Office	Port Arthur	Texas 77640	Federal Bldg., Customhouse 5th and Austin Ave.
	do	Corpus Christi	Texas 78403	P.O. Box 1621
	do	Galveston	Texas 77550	201 Customhouse

COAST GUARD DISTRICT COMMANDERS AND MERCHANT MARINE ACTIVITIES

District	Title	City	State	Address
9th	Commander, 9th Coast Guard District	Cleveland	Ohio 44199	1240 East 9th St.
	Chief, Merchant Marine Safety Division	do	do	do
	*Officer in Charge, Marine Inspection	Chicago	Illinois 60607	610 South Canal St.
	*do	St. Ignace	Michigan 49781	Municipal Bldg.
	*Commanding Officer Marine Safety Office	Buffalo	New York 14202	1111 Federal Bldg., 111 W. Huron St.
	*do	Cleveland	Ohio 44114	1055 East 9th St.
	*do	Detroit	Michigan 48226	1200 Cadillac Tower Bldg., 65 Cadillac Square
	*do	Duluth	Minnesota 55802	Canal Park
	*do	Toledo	Ohio 43604	501 Federal Bldg., 234 Summit St.
11th	Commander, 11th Coast Guard District	Long Beach	California 90802	Heartwell Bldg., 19 Pine Ave.
	Chief, Merchant Marine Safety Division	do	do	do
	*Officer in Charge, Marine Inspection	San Pedro	California 90731	(Los Angeles-Long Beach), 2035 Customhouse, 300 S. Ferry St.
	*Commanding Officer, Marine Safety Office	San Diego	California 92101	2710 Harbor Drive
12th	Commander, 12th Coast Guard District	San Francisco	California 94126	630 Sansome St.
	Chief, Merchant Marine Safety Division	do	do	do
	*Commanding Officer, Marine Safety Office	do	do	1 Embarcadero Ct., Suite 309
13th	Commander, 13th Coast Guard District	Seattle	Washington 98174	Federal Bldg. 915 2nd Ave.
	Chief, Merchant Marine Safety Division	do	do	do
	*Officer in Charge, Marine Inspection	do	Washington 98134	1519 Alaskan Way S., Bldg 1
	*Commanding Officer, Marine Safety Office	Portland	Oregon 97209	6767 N. Basin

COAST GUARD DISTRICT COMMANDERS AND MERCHANT MARINE ACTIVITIES

District	Title	City	State	Address
14th	Commander, 14th Coast Guard District	Honolulu	Hawaii	P.O. Box 48, FPO San Francisco 96610
	Chief, Merchant Marine Safety Division	do	do	do
	*Officer in Charge, Marine Inspection	do	Hawaii 96813	233 Keawe St. Room 916
	Commanding Officer, Marine Safety Office	Guam		P.O. Box 157, FPO San Francisco 96630
17th	Commander, 17th Coast Guard District	Juneau	Alaska	FPO Seattle 93771
	Chief, Merchant Marine Safety Division	do	do	do
	*Commanding Officer, Marine Safety Office	do	do	do
	*do	Anchorage	do	FPO Seattle 98774

* Indicates those offices at which examinations for Third and Second Assistant Engineers are administered.

THIRD ASSISTANT ENGINEER
STEAM AND MOTOR
SPECIMEN EXAMINATION QUESTIONS

ANSWER KEY

I. Propulsion Diesel Engines, Fuel Oil & Lube Oil Systems

1.	C	6.	D
2.	B	7.	B
3.	B	8.	D
4.	B	9.	C
5.	D	10.	A

II. Diesel Engine Cooling, Starting, Intake & Exhaust Systems and Drive Train

1.	B	6.	D
2.	C	7.	A
3.	A	8.	D
4.	C	9.	D
5.	C	10.	C

III. Auxiliary Boilers, Water Systems & Engineering Safety

1.	D	6.	B
2.	D	7.	A
3.	D	8.	A
4.	A		
5.	D		

IV. Auxiliary Diesel Engines, Water Systems & Engineering Safety

1.	D	5.	C
2.	B	6.	B
3.	D	7.	B
4.	C	8.	B

V. Miscellaneous Systems

1.	A	6.	C
2.	D	7.	C
3.	D	8.	C
4.	A	9.	B
5.	D	10.	B

VI. Electricity

1.	C	6.	D
2.	D	7.	C
3.	D	8.	D
4.	A	9.	B
5.	C	10.	B

VII Boilers, Steam & Water Cycles

1.	D	6.	D
2.	B	7.	C
3.	A	8.	A
4.	C	9.	C
5.	B	10.	A

VIII. Turbine Assemblies, Fuel Oil & Lube Oil Systems

1.	A	6.	C
2.	C	7.	C
3.	D	8.	B
4.	C	9.	A
5.	B	10.	D

SECOND ASSISTANT ENGINEER
STEAM AND MOTOR
SPECIMEN EXAMINATION QUESTIONS

ANSWER KEY

I. Boilers, Fuel Oil & Combustion Control Systems

1.	A	6.	B
2.	A	7.	B
3.	A	8.	A
4.	B	9.	B
5.	C	10.	B

II. Diesel Engines and Associated Diesel Systems

1.	B	6.	C
2.	B	7.	A
3.	B	8.	A
4.	A	9.	A
5.	A	10.	C

III. Review

1.	A	6.	A
2.	C	7.	C
3.	D	8.	B
4.	A	9.	A
5.	A	10.	B

IV. Engineering Safety

1.	A	6.	D
2.	A	7.	C
3.	C	8.	A
4.	C	9.	D
5.	D	10.	B

V. Watertube Boilers

1.	D	6.	B
2.	D	7.	A
3.	C	8.	A
4.	D	9.	C
5.	D	10.	B

VI. Feedwater, Fuel Oil & Combustion Control Systems

1.	D	6.	D
2.	B	7.	C
3.	C	8.	A
4.	C	9.	C
5.	A	10.	A

*U.S.G.P.O. 634-657/1302-646